

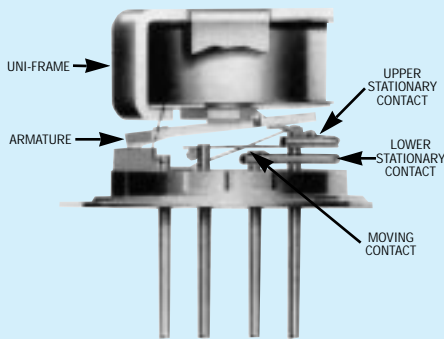
# TELEDYNE RELAYS

## HIGH SHOCK TO-5 RELAY DPDT

**SERIES  
412K  
422K**

SERIES DESIGNATION	RELAY TYPE
412K	DPDT high shock relay
422K	DPDT high shock magnetic latching relay

### INTERNAL CONSTRUCTION 412K



### DESCRIPTION

The TO-5 relay, originally conceived and developed by Teledyne, has become one of the industry standards for low level switching from dry circuit to 1 ampere. Designed expressly for high density PC Board mounting, its small size and low coil power dissipation make the TO-5 relay one of the most versatile subminiature relays available.

The High Shock Series of TO-5 Relays are designed to withstand shock levels up to 4000 g's, .5 millisecond duration. Special material selection and construction details provide assurance that critical elements of the relay structure and mechanism will not be permanently displaced or damaged as a result of extremely high g level shocks.

Typical usage:

- Commercial avionics aircraft control
- Commercial aircraft control systems
- Transportation systems (Rail/Truck)

By virtue of its inherently low intercontact capacitance and contact circuit losses, the TO-5 relay has shown itself to be an excellent subminiature RF switch for frequency ranges well into the UHF spectrum. A typical RF application for the TO-5 relay is in hand held radio transceivers, wherein the combined features of good RF performance, small size, low coil power dissipation and high reliability make it a preferred method of T-R switching (see Figure 1 and 2).

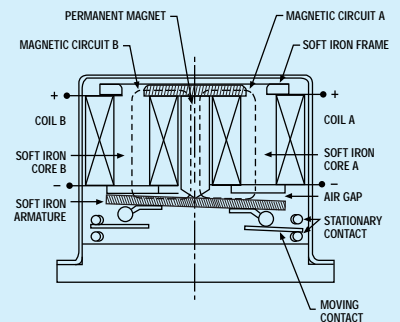
412K ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS	
Temperature (Ambient)	-65°C to + 125°C
Vibration	30 g's to 3000 Hz (Note 3)
Shock	75 g's for 6 msec. (Note 3) 4000 g's 0.5 msec. axial plane 1000 g's 0.5 msec. side planes (Note 6) half-sine
Acceleration	50 g's (Note 3)
Enclosure	All welded, hermetically sealed
Weight	0.09 oz (2.55 gms.) max.

422K ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS	
Temperature (Ambient)	-65°C to + 125°C
Vibration	30 g's to 3000 Hz (Note 3)
Shock	100 g's for 6 msec. (Note 3) 200 g's 0.5 msec. (Note 6) half-sine
Acceleration	50 g's (Note 3)
Enclosure	All welded, hermetically sealed
Weight	0.10 oz (2.84 gms.) max.

### PRINCIPLE OF OPERATION 422K

Energizing Coil B produces a magnetic field opposing the holding flux of the permanent magnet in Circuit B. As this net holding force decreases, the attractive force in the air gap of circuit A, which also results from the flux of the permanent magnet, becomes great enough to break the armature free of Core B, and snap it into a closed position against Core A. The armature then remains in this position upon removal of power from Coil B, but will snap back to position B upon energizing Coil A. Since operation depends upon cancellation of a magnetic field, it is necessary to apply the correct polarity to the relay coils as indicated on the relay schematic.

When latching relays are installed in equipment, the latch and reset coils should not be pulsed simultaneously. Coils should not be pulsed with less than the nominal coil voltage and the pulse width should be a minimum of three times the specified operate time of the relay. If these conditions are not followed it is possible for the relay to be in the magnetically neutral position.



## SERIES 412K/422K

### GENERAL ELECTRICAL SPECIFICATIONS (-65°C to +125°C unless otherwise noted) (Notes 1 & 2)

Contact Arrangement	2 Form C (DPDT)	
Rated Duty	Continuous	
Contact Resistance	412K: 0.1 ohms max. before life; 0.2 ohms max. after life at 1A/28VDC 422K: 0.125 ohms max. before life; .225 ohms max. after life at 1A/28VDC } (measured 1/8" below header.)	
Contact Load Rating (DC) (See Fig. 3 for other DC resistive voltage/current ratings)	Resistive: 1 Amp/28VDC Inductive: 200 mA/28VDC (320 mH) Lamp: 100 mA/28VDC Low Level: 10 to 50 µA/10 to 50 mV	
Contact Load Ratings (AC)	Resistive: 250 mA/115VAC, 60 and 400Hz (Case not grounded) 100 mA/115VAC, 60 and 400Hz (Case grounded)	
Contact Life Ratings	10,000,000 cycles (typical) at low level 1,000,000 cycles (typical) at 0.5A/28VDC resistive 100,000 cycles min. at all other loads specified above	
Contact Overload Rating	2A/28VDC Resistive (100 cycles min.)	
Contact Carry Rating	Contact factory	
Coil Operating Power	412K Series: 500 mW typ. @ 25°C	422K: 200 mW typ. @ 25°C
Operate Time (Note 5)	412K: 2.0 msec max.	422K: 1.5 msec max.
Release Time	1.5 msec max. (412K only)	
Contact Bounce	1.5 msec max	
Intercontact Capacitance	0.4 pf typical	
Insulation Resistance	10,000 megohms min. between mutually isolated terminals	
Dielectric Strength	Atmospheric pressure: 500 VRMS/60 Hz	70,000 ft.: 125 VRMS/60Hz
Minimum Operate Pulse	4.5 msec @ Nominal Rated Voltage (422K only)	

### 412K SERIES RELAY

#### DETAILED ELECTRICAL SPECIFICATIONS (-65°C to +125°C unless otherwise noted) (Note 2)

BASE PART NUMBERS		412K-5	412K-6	412K-9	412K-12	412K-18	412K-26
Coil Voltage	Nom.	5.0	6.0	9.0	12.0	18.0	26.5
	Max.	5.8	8.0	12.0	16.0	24.0	32.0
Coil Resistance (Ohms ± 10% @ 25°C)		50	80	160	300	600	1350
Pick-up Voltage (VDC, Max.)		4.3	5.2	7.6	10.0	14.3	21.0
Drop-out Voltage (VDC)	Min.	0.14	0.18	0.35	0.41	0.59	0.89
	Max.	2.5	3.2	4.9	6.5	10.0	13.0

### 422K SERIES RELAY

#### DETAILED ELECTRICAL SPECIFICATIONS (-65°C to +125°C unless otherwise noted) (Note 2)

BASE PART NUMBERS		422K-5	422K-6	422K-9	422K12	422K-18	422K-26
Coil Voltage (VDC)	Nom.	5.0	6.0	9.0	12.0	18.0	26.5
	Max.	5.8	8.0	12.0	16.0	24.0	32.0
Coil Resistance (Ohms ± 10% @ 25°C)		61	120	280	500	1130	2000
Set & Reset Voltage (VDC, Max.)		3.5	4.5	6.8	9.0	13.5	18.0

PERFORMANCE CURVES (NOTE 1)

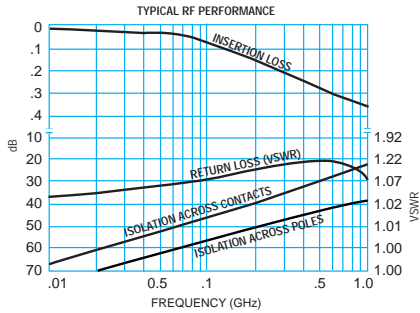


FIGURE 1 (412K)

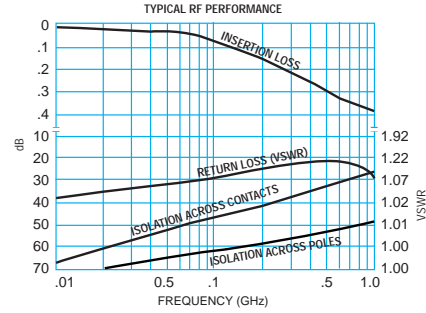


FIGURE 2 (422K)

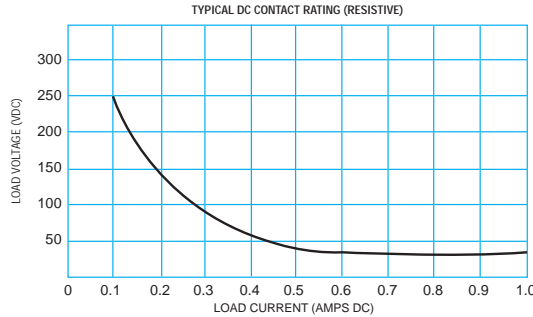
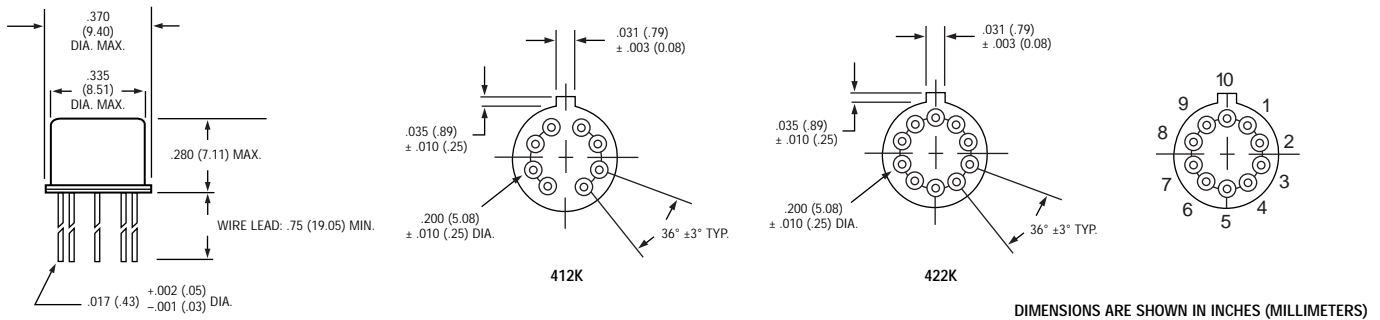


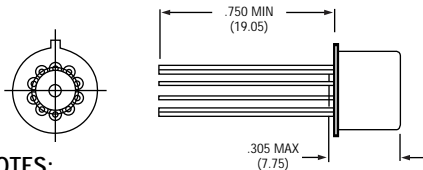
FIGURE 3

OUTLINE DIMENSIONS



SPACER PAD

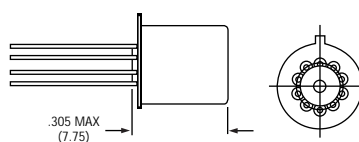
Relays can be supplied with a spacer pad attached to the relay header. The pad permits the relay to be spaced away from the mounting surface facilitating solder joint inspection. To order add **M4** to the part number: (e.g. 422KM4-26).



- NOTES:**
1. Material: Polyester film.
  2. Increase contact resistance by 0.01 ohm.

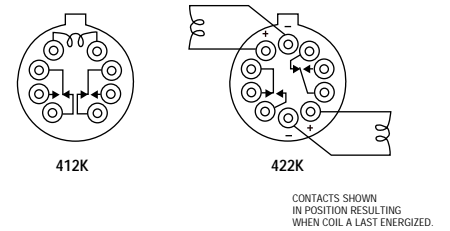
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SCHEMATIC DIAGRAMS



SCHEMATICS ARE VIEWED FROM TERMINALS

NOTES:

1. Characteristics shown as "typical" are based on available data and are best estimates. No on-going verification tests are performed.
2. Unless otherwise specified parameters are initial views.
3. Relays will exhibit no contact chatter in excess of 10  $\mu$ sec or transfer in excess of 1  $\mu$ sec. For other levels, contact factory.
4. SURVIVAL ONLY - CONTACT CHATTER MAY OCCUR.
5. Measured at nominal rated coil voltage at 25°C.